REMARKS

Claims 1-6, 9 and 15 are pending in the present Application. Claim 2 has been canceled, and claims 1, 3 and 5 have been amended, leaving claims 1-6 and 9 for consideration upon entry of the present Amendment.

The specification has been amended as discussed in detail below.

Claim 1 has been amended to better define the invention. Support for this amendment can be found at least at page 1, line 13; page 5, liens 4-10; page 7, lines 2-15; Examples 1 and 2; and throughout the specification.

Claim 3 has been amended for consistency with claim 1.

Claim 5 has been amended to better define the invention. In particular, the unit (g/mol) has been added to claim 5. Applicants respectfully submit that it well known that the unit for the molecular weight of polymer or copolymer is "g/mol."

In addition, Applicants have filed herewith an updated Sequence Listing including SEQ ID NOs 15-18. SEQ ID NOs 15-18 correspond to the nucleic acid sequence and three polypeptide sequences in Figures 5 and 6.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Compliance with Sequence Rules

In the pending Office Action, the Examiner asserted that application fails to fully comply with the requirements of 37 C.F.R. 1.821 through 1.825. (Office Action dated 4/28/2009, page 3) In particular, the Examiner noted that Figure 5 discloses one nucleic acid sequence and three polypeptide sequences that are not labeled using a SEQ ID No. (Office Action dated 4/28/2009, page 3) The Examiner requested that labeling of the sequences using a SEQ ID No. must be inserted into the BRIEF DESCRIPTION OF THE DRAWINGS or into the Figure directly. (Office Action dated 4/28/2009, page 3)

Applicants have amended the BRIEF DESCRIPTION OF THE DRAWINGS to include reference to SEQ ID NOs. 15-18, which describe the one nucleic acid sequence and three polypeptide sequences of Figures 5 and 6, respectively. In addition, Applicants have filed herewith an updated sequence listing which includes SEQ ID NOs. 15-18, which describe the one nucleic acid sequence and three polypeptide sequences of Figures 5 and 6, respectively.

Applicants request entry of the updated sequence listing. Support for newly added SEQ ID NOs. 15-18 can be found at least at Figures 5 and 6.

Applicants believe that the amendments to the BRIEF DESCRIPTION OF THE DRAWINGS and the updated sequence listing address the Examiner's concern. Specifically, Applicants believe that the amended specification meets with the requirements of 37 C.F.R. 1.821 through 1.825. Applicants respectfully request reconsideration.

Specification

The specification is objected to because of the following informalities:

The abstract of the disclosure is objected to because it contains multiple paragraphs. It should have one paragraph. See MPEP § 608.01(b)

(Office Action dated 4/28/2009, page 4)

The Abstract has been amended to include only one paragraph. Applicants believe this amendment overcomes the Examiner's objection. Applicants respectfully request a withdrawal of the objection to the specification.

Claim Objections

Claims 1-6, 9 and 15 are objected to because of the following informalities:

(a) Claim 1 (Claims 2-6, 9 and 15 dependent therefrom) recites "PHA." The use of abbreviation PHA should be spelled out on a first appearance in claims.
(b) Claim 5 recites "molecular weight of the copolymer" without a unit.
(c) Claim 15 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

(Office Action dated 4/28/2009, page 3)

With regard to item (a), Applicants have amended independent claim 1 to recite "A method for preparing a poly(3-hydroxyalkanoate) ("PHA") block copolymer."

With regard to item (b), Applicants have amended Claim 5 to clarify that the unit for the molecular weight of polymer is "g/mol." Applicants respectfully submit that it well known that the unit for the molecular weight of polymer or copolymer is "g/mol."

With regard to item (c), Applicants have cancelled claim 15, rendering the objection moot.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-6, 9 and 15 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office Action dated 4/28/2009, page 5) In particular, the Examiner asserts that claim 1 provides the use of microorganisms, but the claim does not set forth any steps involved in the method/process, and is therefore thus it is unclear. (Office Action dated 4/28/2009, page 5)

The proper standard for indefiniteness is whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification. *Seattle Box Co. v. Industrial Crating and Packing, Inc.*, 731 F.2d 818, 826, 221 U.S.P.Q. 568, 573-574 (Fed. Cir. 1984).

Independent claim 1 has been amended to clarify that the PHA block copolymer is prepared by the method comprising the following steps:

(a) biosynthesizing the PHA block copolymer by culturing a *Pseudomonas* sp. HJ-2 strain (Accession No. KCTC 040-6 BP) using saturated and/or unsaturated carboxylic acid as a carbon source;
(b) extracting the PHA block copolymer by crushing the culture;
(c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and
(d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape.

Applicants respectfully assert that presently amended claim 1 clearly defines the steps (a) to (d) involved in the method or process for preparing a PHA block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects. In addition, the specification provides a detailed description, including examples (Examples 1 and 2), of a method according to claim 1. Applicants believe that one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification.

For these reasons discussed above, Applicants believe that amended claim 1 meets the requirements of 35 U.S.C. § 112, second paragraph. Applicants respectfully request that the office withdraw the rejection of claims 1-6 and 9 under 35 U.S.C. § 112, second paragraph.

Claim 15 has been cancelled.

Claim Rejections Under 35 U.S.C. § 112, First Paragraph

Claims 1-6, 9 and 15 stand rejected under 35 U.S.C. § 112, first paragraph, **enabling deposit**, for lack of enablement. (Office Action dated 4/28/2009, page 6) Applicants respectfully traverse this rejection.

Applicants respectfully submit that the Pseudomonas sp. HJ-2 strain, Accession Number KCTC 0406 BP has been deposited with the Korean Collection for Type Cultures (KCTC) affiliated with the Korean Research Institute of Bioscience and Biotechnology (KRIBB, Korea), under the Budapest Treaty and that the strain will be irrevocably and without restriction or condition released to the public upon the issuance of the patent.

Applicants have attached herewith the certificate copy of deposit regarding *Pseudomonas* sp. HJ-2 strain deposited as KCTC 0406 BP. The certificate copy shows that the Pseudomonas sp. HJ-2 strain was deposited according to the Budapest Treaty, thus, this means is available to those skilled in the art.

Thus, it is believed that the Application satisfies the deposit requirement under 37 C.F.R. 1.801 – 1.809 and the requirements of 35 U.S.C. § 112, first paragraph. Applicants respectfully request that the office withdraw the rejection of claims 1-6 and 9 under 35 U.S.C. § 112, first paragraph. Claim 15 has been cancelled.

Claim Rejections Under 35 U.S.C. § 101

Claims 1-6, 9 and 15 stand rejected under 35 U.S.C. § 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process. (Office Action dated 4/28/2009, page 7) Applicants respectfully traverse this rejection.

As noted above, independent claim 1 has been amended to clarify that the PHA block copolymer is prepared by the method comprising the following steps:

(a) biosynthesizing the PHA block copolymer by culturing a *Pseudomonas* sp. HJ-2 strain (Accession No. KCTC 040-6 BP) using saturated and/or unsaturated carboxylic acid as a carbon source;
(b) extracting the PHA block copolymer by crushing the culture;

(c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and
(d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape.

Applicants respectfully assert that presently amended claim 1 positively recite the steps (a) to (d) involved in the method or process for preparing a PHA block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects.

Since claim 1 positively recite the steps (a) to (d) involved in the method or process for preparing a PHA block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects, Applicants believe that amended claim 1 meets the requirements of 35 U.S.C. § 101. Applicants respectfully request that the office withdraw the rejection of claims 1-6 and 9 under 35 U.S.C. § 101. Claim 15 has been cancelled.

Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1-6 and 9 stand rejected under 35 U.S.C. § 102(b), as being anticipated by Kim et al. (Korean Patent 10-1999-0080695)(hereinafter "Kim"). (Office Action dated 4/28/2009, page 8) Applicants respectfully traverse this rejection.

Independent claim 1 is directed to a method for preparing a poly(3-hydroxyalkanoate) ("PHA") block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects, wherein the PHA block copolymer is prepared by the method comprising the following steps:

(a) biosynthesizing the PHA block copolymer by culturing a *Pseudomonas* sp. HJ-2 strain (Accession No. KCTC 040-6 BP) using saturated and/or unsaturated carboxylic acid as a carbon source;
(b) extracting the PHA block copolymer by crushing the culture;
(c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and
(d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape.

To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Varient Inc.*, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

In making the rejection, the Examiner alleges that claims 1-6 and 9 are drawn to a method for preparing a PHA block copolymer comprising a plurality of 3HB and a plurality of 3HV by biosynthesis using microorganisms Pseudomonas sp. HJ-2 strain deposited as KCTC 0406 BP. (Office Action dated 4/28/2009, page 8) However, Applicants respectfully note that the claims of the instant application are also directed to a method for preparing the PHA block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects.

As seen on page 3, lines 1-6 of the original specification, the inventors of the claimed invention have surprisingly discovered that the specific PHA block copolymer exhibits shape memory effects, and shape memory effects are physical properties that were partially confirmed in metals and general polymers, but were not confirmed hitherto in PHAs primarily prepared via biosynthesis.

In order to render the claimed subject matter clear, presently amended claim 1 further defines the process for preparing the PHA block copolymer having the aforementioned properties as the following: (c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and (d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape.

In this regard, the Examiner alleges Kim teaches that the produced PHA block copolymer would be presented with 10 to 50 tons after heating to about 150°C to make permanently shaped film (see page 7, lines 37-38).

However, the aforementioned description in Kim just shows one of general methods for preparing a film using the PHA block copolymer. The thus prepared film cannot provide the temperature-sensitive shape memory effects.

Further, in rejecting the original claim 3, the Examiner alleges the PHA block copolymer produced according to Kim would be used to make rubber band, for example on page 7, line 9, which would recover its original state of originally shaped material when it is released from a stretched shape (i.e., temporarily shaped) since its melting point is 40-60°C (see bottom of page 2 and bottom of page 3).

Applicants respectfully assert that the Examiner has incorrectly compared "rubber elasticity" with "shape memory effect." Rubber elasticity refers to the phenomenon wherein the original shape of a object is recovered when an applied stretching force is released. In contrast, according to the shape memory effect, the original shape is not recovered even after an applied stretching force is released from a stretched shape. For a shape memory material, democratizing the shape memory effect, will return to the original shape (the permanently deformed particular shape) only when the temperature of the shape memory material reaches a certain temperature called the transformation temperature. In the case of the present invention, the transformation temperature is a temperature ranging from a glass transition temperature to melting point thereof. In consequence, Kim fails to teach or suggest the method for preparing the PHA block copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects.

For these reasons, Kim fails to teach a process of preparing a copolymer having orientation-induced rubber-elasticity and temperature-sensitive shape memory effects, as presently claimed.

In summary, Kim fails to teach a process of preparing a copolymer having orientation-induced rubber-elasticity and **temperature-sensitive shape memory effects**, as claimed. In particular, Kim fails to teach the steps of (c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and (d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape. For this reason, Kim does not teach all elements of the claims and cannot anticipate the claims under 35 U.S.C. § 102(b). Applicants respectfully request a withdrawal of the rejection and allowance of the claims.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-6, 9 and 5 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Kim et al. (Korean Patent 10-1999-0080695) in view of Timm et al. (Appl Microbiol Biotechnology, 1994, Vol. 40, pages 669-675)(hereinafter "Timm") as evidenced by Daniel et al (Current Microbiology, E publication June 13, 2005, Vol. 50, pages 329-333)(hereinafter "Daniel"). Applicants respectfully traverse this rejection.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). "A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must "identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does." *Id.*

As discussed above, Kim fails to teach the steps of (c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and (d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape. Timm fails to make up for these deficiencies.

Timm is cited for teaching a general method for identification of polyhydroxyalkanoic acid synthase genes from pseudomonads. (Office Action dated 4/28/2009, page 10) Timm fails to teach the steps of (c) heating the PHA block copolymer to a temperature ranging from a melting point to thermal decomposition temperature thereof, thereby preparing a permanently deformed particular shaped PHA block copolymer; and (d) subjected the permanently deformed particular shaped PHA block copolymer to a constant external force at near room temperature for a predetermined period of time, thereby forming a PHA block copolymer having a temporary shape, and therefore cannot make up for the deficiencies of Kim.

Since the combination of Kim and Timm fail to teach all elements of the claimed invention, Applicants believe that a *prima facie* case of obviousness has not been made. Applicants respectfully request a withdrawal of the rejection and allowance of the claims.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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